Number of Reconstructed photons

$$(1-\frac{e^{-1}.1^{0}}{0!}).X_0^{Cu}.\ln(\frac{E_{tag\max}}{E_{tag\min}}).(1-e^{-1.47.\frac{7}{9}}).n.\varepsilon_{rec}$$

Poisson
0 e/pulse

Converter
0.9% or 2.7%

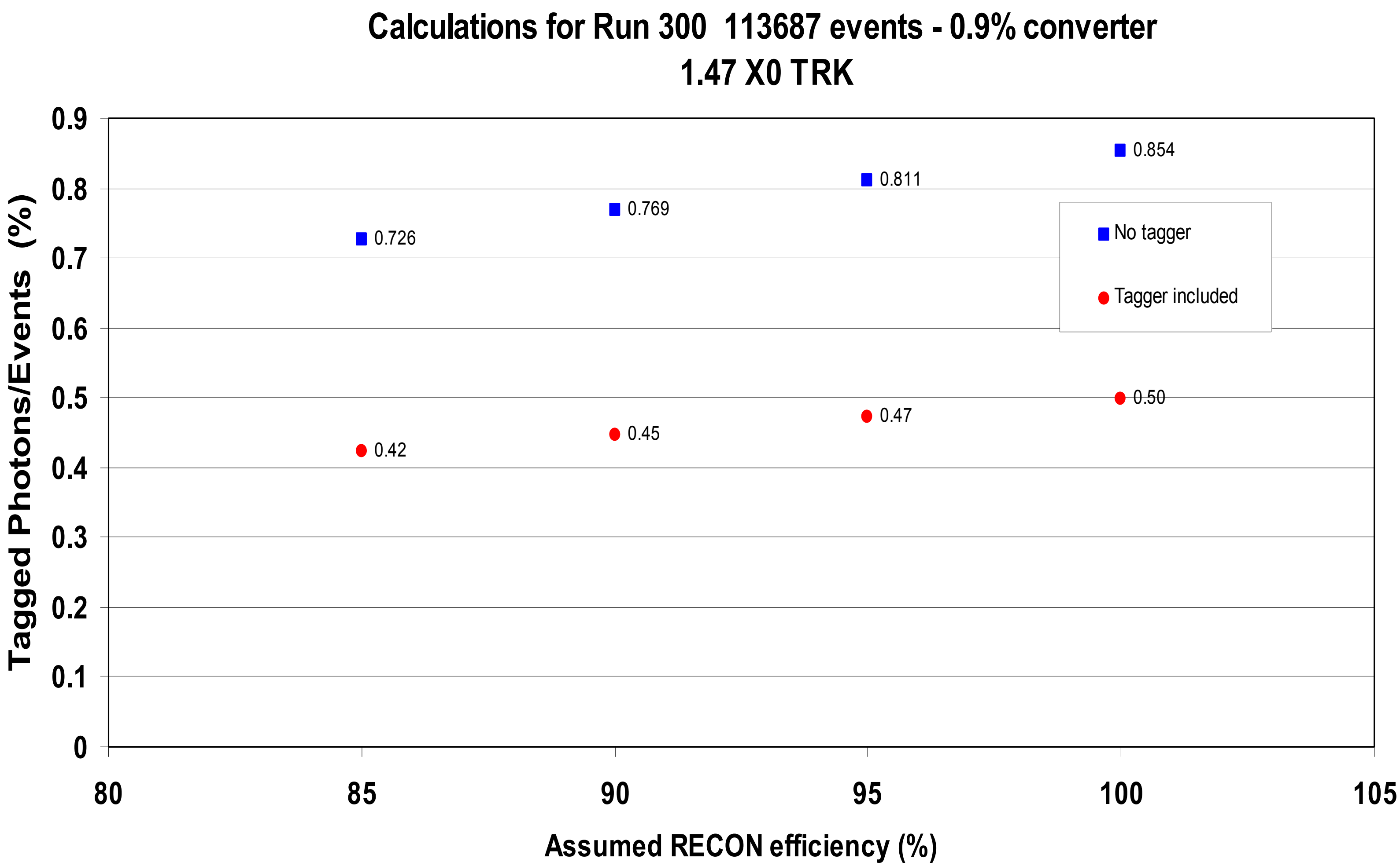
Tagger
Acceptance

Probability
of conversion

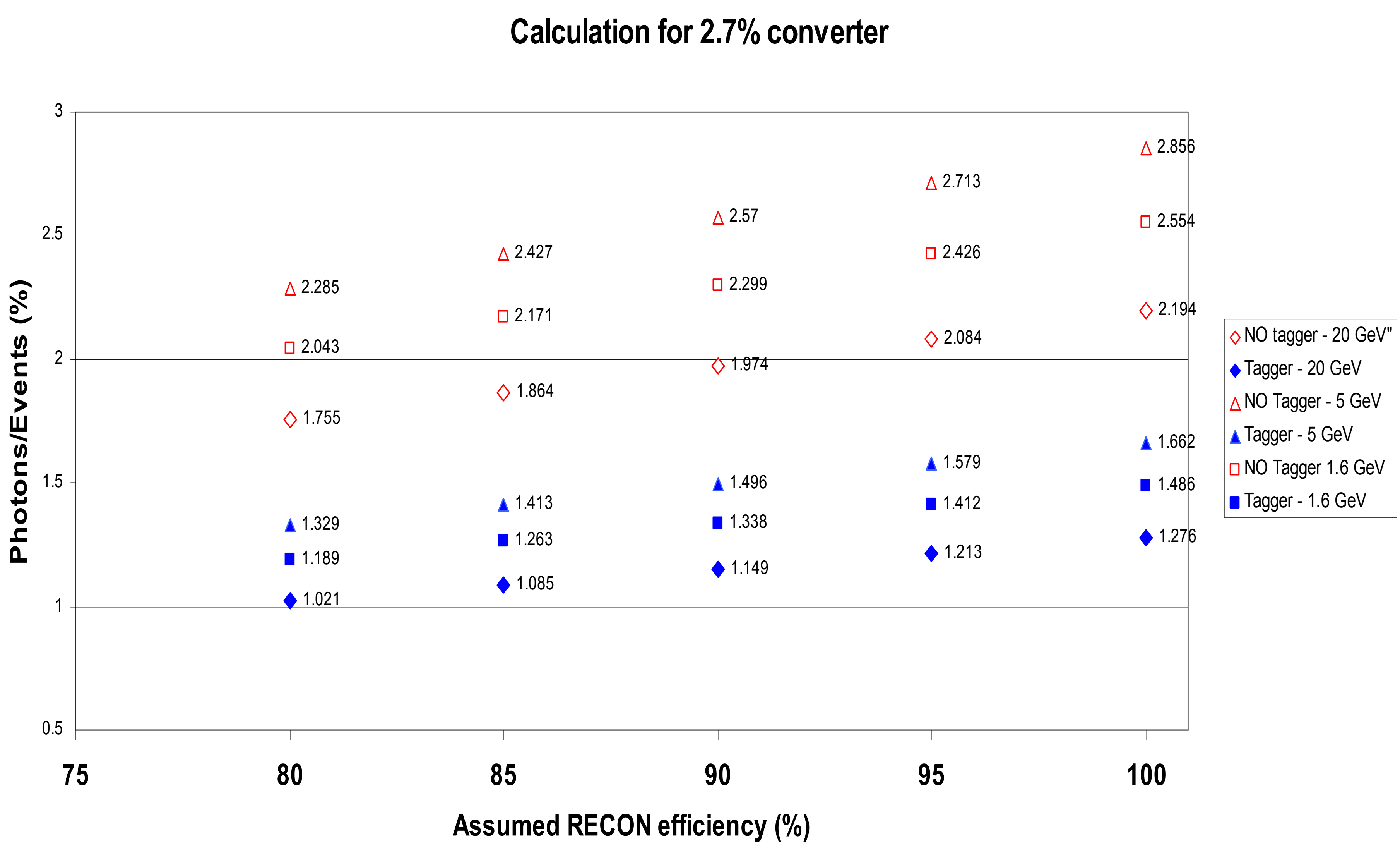
events

RECON
efficiency

Assume tagger efficiency is 100%



If we require tagged photons in data we get about 0.43 % and agrees well with calculations. However, stats were not enough and we did not require a tagged photon rather a correlation between energy in the tagger and in the calorimeter



Calculation for 2.7% converter
Photons/Events (%)
3
2.5
2
1.5
1
0.5
75
80
85
90
95
100
Assumed RECON efficiency (%)
2.285
2.043
1.755
1.329
1.189
1.021
2.427
2.171
1.864
1.413
1.263
1.085
2.57
2.299
1.974
1.496
1.338
1.149
2.713
2.426
2.084
1.579
1.412
1.213
2.856
2.554
2.194
1.662
1.486
1.276
NO tagger - 20 GeV"
Tagger - 20 GeV
NO Tagger - 5 GeV
Tagger - 5 GeV
NO Tagger 1.6 GeV
Tagger - 1.6 GeV

Tagger

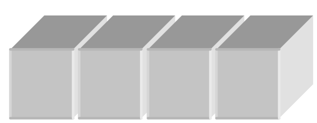
- Tagger efficiency is high.
- We only used Energy of the tagger but not to tag events with one single photon
- We believe our correction method (30%) to give us PSF of the order of 10%

Beam Type				
	Photon	Hadron	Electron	Cosmic Rays
Engineering Model	No	No	No	Yes
Calibration Unit	Yes	Yes	Yes	Yes
LAT Flight	No	No	No	Yes

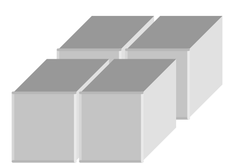
We assume functionality tests (TBD) are done by subsystems (TBR) at their local institutions. Some subset will be done during beam test and its impact has to be taken into account in the scheduling

	ACD	Tracker	Calorimeter
Engineering Model (EM)	14 tiles (10 migrate to the calibration unit)	Dummy trays • Thin 3% (13) • Thick 18% (2) Live trays • Thin 3% (2) • Thick 18% (2)	Fully instrumented ?
Calibration Unit (CU)	10 tiles	Fully instrumented	Fully instrumented
LAT Flight (LAT)	Fully instrumented	Fully instrumented	Fully instrumented

For the calibration units we have discussed two possible configurations.

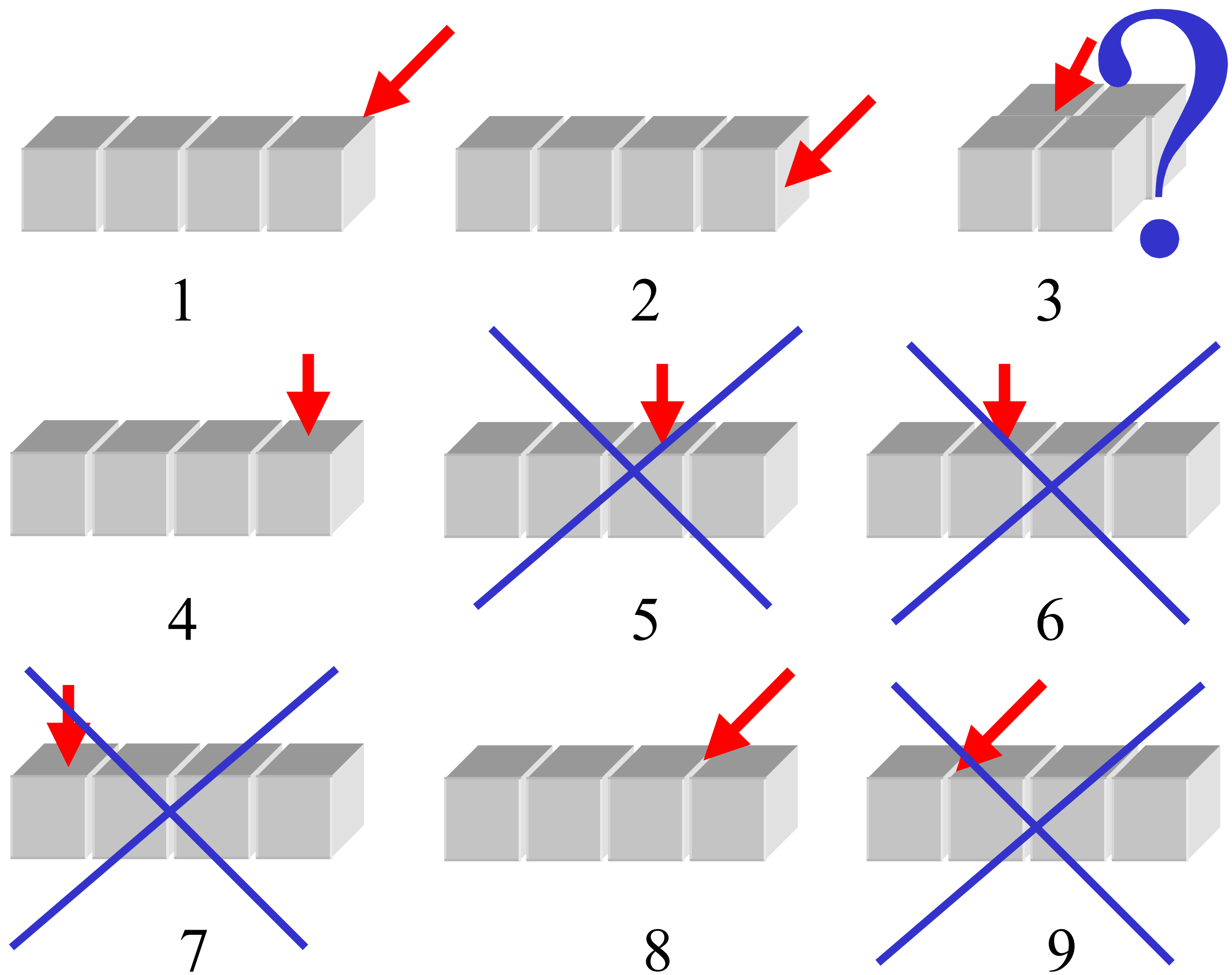


1 x 4



2 x 2

4 Photon Beam configurations - 3 months



Descoping…

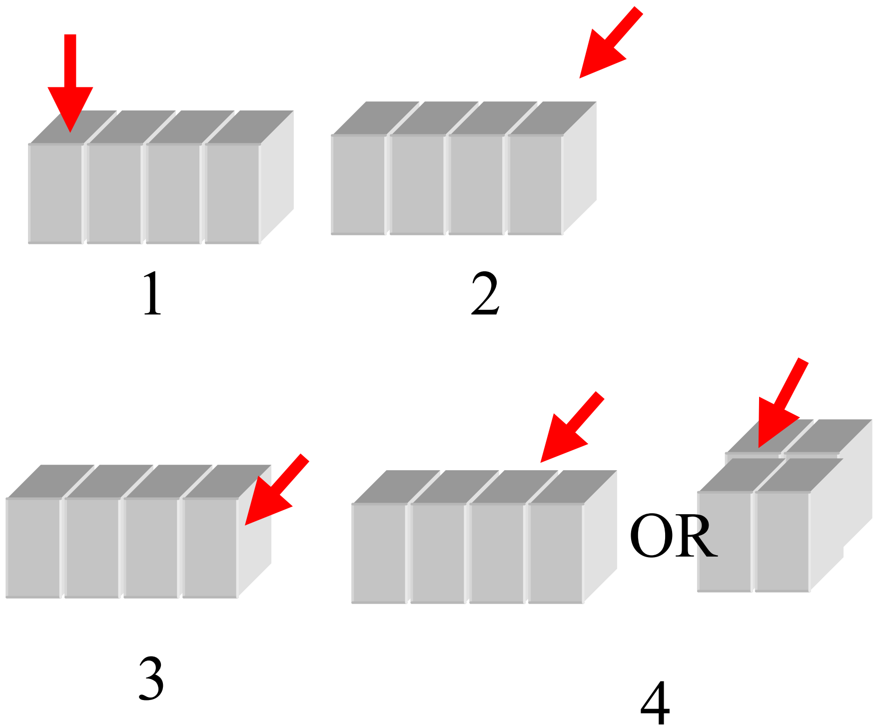
- Remove 5,6,7 or argue that one needs to test all 16 towers
- Remove 9 because interfaces are not too different
- 3 and 8 must be studied with MC before we make a decision

The main motivation for the high energy photon beam is to characterize the Point Spread Function (PSF), Effective Area (A) and Field of View (FOV) for off-axis incidence for photon energies > 100 MeV. The energy resolution (E) will also be measured but its main characterization will occur in the positron beam.

	0 Deg	30 Deg	60 deg	80 deg
100 MeV	A, PSF,E	A, PSF,E	A, PSF,E	A, PSF,E
500 MeV	A, PSF,E	A, PSF,E	A, PSF,E	A, PSF,E
1 GeV	A, PSF,E,FOV	A, PSF,E,FOV	A, PSF,E,FOV	A, PSF,E,FOV
10 GeV	A, PSF,E	A, PSF,E	A, PSF,E	A, PSF,E

For every point in the test matrix we require 4000 reconstructed (with Energy measured by a photon tagger) This is driven by the PSF measurement. In BTEM 99/00 we obtained from 400-1000 photons for data and 2500 for MC runs.

No azimuth angles due to LAT symmetry



Configuration 1= **160** hours of beam.

Configuration 2= **480** hours of beam.

Configuration 3= **480** hours of beam

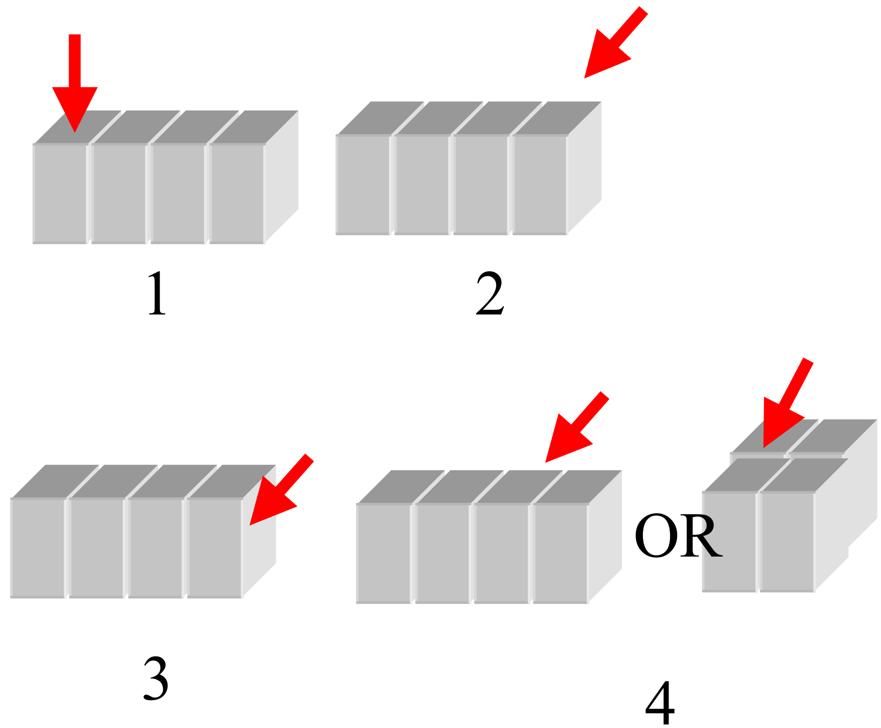
Configuration 4= **480** hours of beam.

Total of 1600 hours of beam. Assume the beam uptime to be 80%, so we need a total of 1920 hours of beam = 80 days. We add 10 days for unforeseen problems to **obtain 3 months of run time.** We need an additional month to set up the beam and the instrument (TBR), the set-up time may take longer due to the fact that we are dealing with Flight Qualified towers.

The main motivation for the low energy photon beam is to characterize the Point Spread Function (PSF), Effective Area (A) and Field of View (FOV) for off-axis incidence for photons of energies < 100 MeV. The energy resolution (E) will also be measured but its main characterization will be done with cosmic rays. This will also be useful for developing algorithms to estimate the energy loss in the tracker (L).

	0 Deg	30 Deg	60 deg	80 deg
20 MeV	**A, PSF,E,L**	**A, PSF,E**	**A, PSF,E**	**A, PSF,E**
50 MeV	**A, PSF,E,FOV,L**	**A, PSF,E,FOV**	**A, PSF,E,FOV**	**A, PSF,E,FOV**

No azimuth angles due to LAT symmetry



Configuration 1= **80** hours of beam.

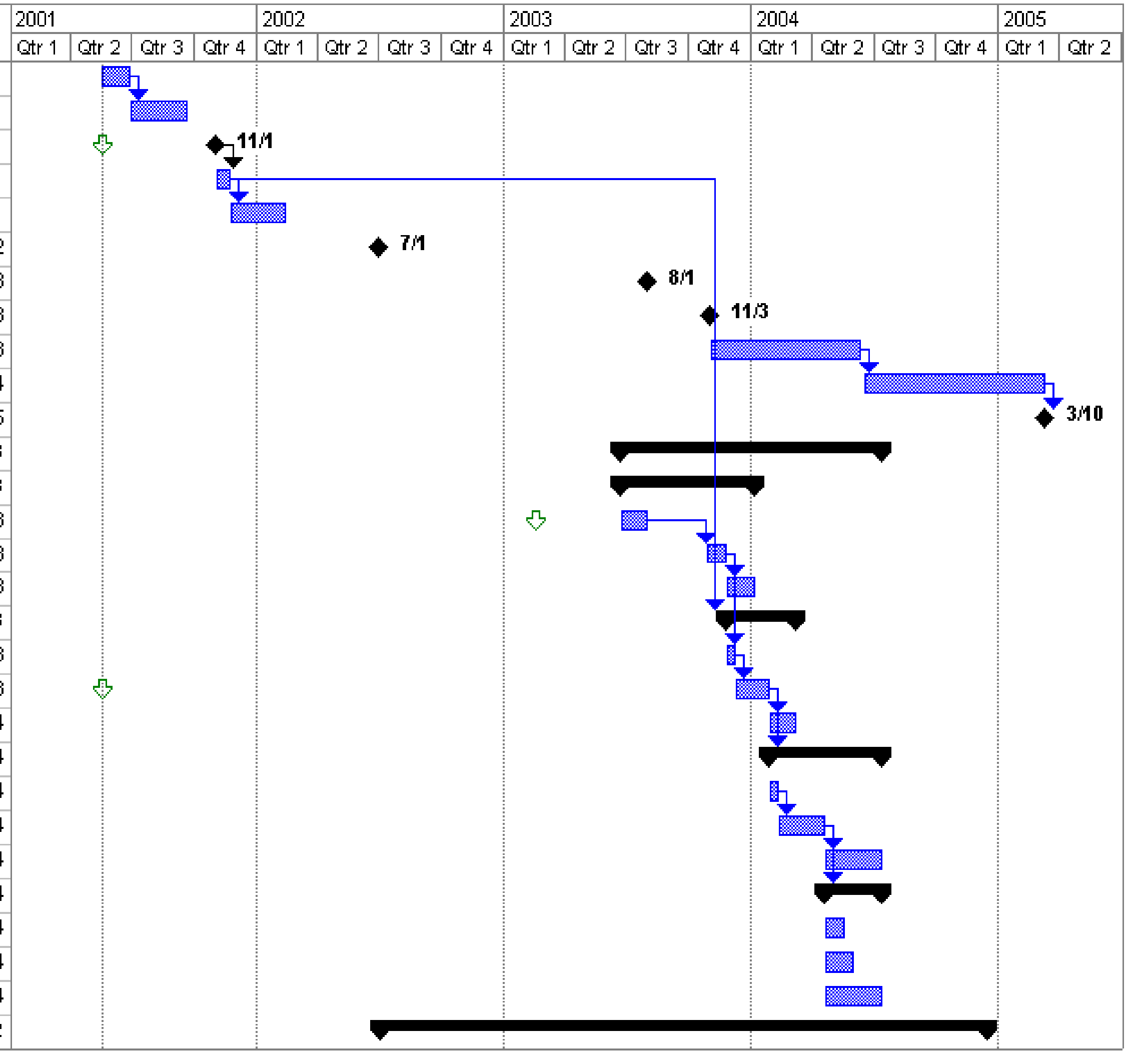
Configuration 2= **240** hours of beam.

Configuration 3= **240** hours of beam

Configuration 4= **240** hours of beam.

Total of 800 hours of beam. Assume the beam uptime to be 80%, so we need a total of 960 hours of beam = 40 days. We add 5 days for unforeseen problems to **obtain 1 1/2 months of run time.** We need an additional month to set up the beam and the instrument

ID	Task Name	Duration	Start
1	Beam Test Calibration Plan	30 days	Thu 5/17/01
2	Software checks	60 days	Thu 6/28/01
3	PDR	1 day?	Thu 11/1/01
4	Revisit Beam Test Calibration Plan	14 days	Fri 11/2/01
5	Final Plan	60 days	Thu 11/22/01
6	Engineering Model at SLAC	1 day?	Mon 7/1/02
7	2 Qual Towers available for Beam Test	1 day?	Fri 8/1/03
8	4 Towers ready for Beam test	1 day?	Mon 11/3/03
9	LAT INT assembly	160 days	Mon 11/3/03
10	Environmental Tests	190 days	Thu 6/17/04
11	Ship Date for LAT	1 day?	Thu 3/10/05
12	**Beam Tests**	**276 days**	**Mon 6/23/03**
13	**Positron beam**	**141 days**	**Mon 6/23/03**
14	Set up	30 days	Mon 6/23/03
15	Run time	20 days	Tue 10/28/03
16	Data Analysis	30 days	Tue 11/25/03
17	**Low energy Photon Beam**	**75 days**	**Tue 11/25/03**
18	Set up	10 days	Tue 11/25/03
19	Run time	35 days	Tue 12/9/03
20	Data Analysis	30 days	Tue 1/27/04
21	**High energy Photon Beam**	**120 days**	**Tue 1/27/04**
22	Set up	10 days	Tue 1/27/04
23	Run time	50 days	Tue 2/10/04
24	Data Analysis	60 days	Tue 4/20/04
25	**Hadron Beam**	**60 days**	**Tue 4/20/04**
26	Set up	20 days	Tue 4/20/04
27	Run time	30 days	Tue 4/20/04
28	Data Analysis	60 days	Tue 4/20/04
29	**Cosmic Ray Tests**	**642 days?**	**Tue 7/2/02**



To do List - for next meeting

- Find Van der Graaf @SLAC and check how one can use it
- Apply for coherent beam (3 months)
- Apply for ESA (6 months)
- Prepare a Test Matrix for positron beam
- Plan for hadron beam tests at BNL
- Incorporate timing issues in the discussion